Frequencies VHF, UHF, SHF Newsletter NZ

This newsletter is compiled by Kevin Murphy ZL1UJG to promote operational and construction activity on the VHF, UHF and SHF Amateur Radio allocations in New Zealand...(and overseas).

Articles for this Newsletter can be sent via email to rfman@xtra.co.nz

Post to K Murphy, 8 Tamar Place, Hamilton, New Zealand.

Ph 07 8470041

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Previous issues – http://www.netspace.net.au/~rpreston/index.htm

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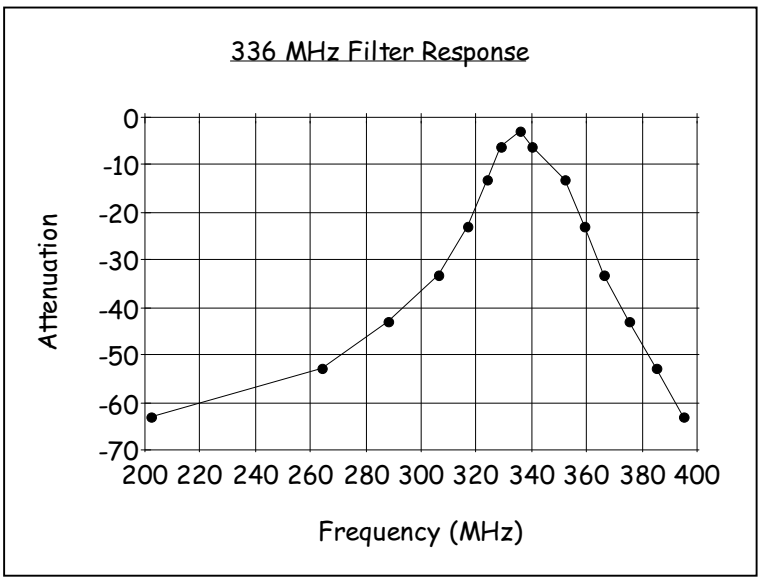
NZART Technology Convention

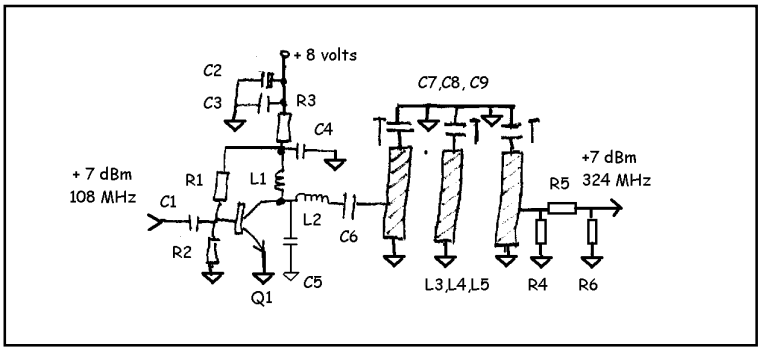
This Easter on April 19th & 20th 2003, the Hamilton Amateur Radio Club is hosting the NZART Technology Convention. They will be using the premises of the Hamilton Astronomical Society, located in Brymer Road, Hamilton, which is adjacent to the Hamilton Zoo which has plenty of parking.
I have a form if you wish to attend. Numbers will be held to 100 maximum.
It is highly probable that I will have a test equipment setup loaned from work * to check transceivers, transverters and oscillators (RF power up to 10368 MHz, Spectrum Analysis to 5760 MHz)
*(Repair Group Limited)

Filter PCB's

108 to 324 MHz Multiplier.

The first step was prototyping the filter. I had some fun when I tried adding 3 SMD 33 nH inductors near the trimmer capacitors. The Bandwidth was an incredible 3.2 MHz at the 324 MHz centre frequency. The insertion loss was another matter though at 28 dB!! This excessive loss was due to low Q factor of the SMD inductors and minimal coupling. I would have to do something different…
Using just the existing striplines, I resonated the tuned circuits at the required frequency by adding extra fixed capacitors across the trimmers. This works well however the tuning range with 2-10 pF trimmers is somewhat limited. In order to extend the tuning range the trimmers should be 2-22 pF and with these fitted later, I was able to tune from 288 MHz to 324 MHz. The middle capacity is different from the outside values due to the loading effects of the outer tuned circuits.
A prototype filter tuned to 336 MHz shows good insertion loss at ~ 3dB and good rejection away from the centre frequency. (See graph page2) Caps are 2-10pF + 27 pF on outer striplines and 2-10pF + 22 pF on inner stripline.
I looked at the close in filter response and there are two distinct peaks. One of ~ 3 dB loss and the other of about 7-10 dB loss. This is probably due to overcoupling between the adjacent striplines. (Shielding the trimmers did not cause the response to change. If using the filter in a multiplier this slight double peaking is of no concern.
I found if I tuned the 3rd trimmer slightly towards minimum capacitance so that the loss is ~ 5 dB the filter bandwidth is about 20 MHz with a flat response (~ 1 dB ripple Pk to Pk).





Using the same type of design as used in the 324/648 MHz multiplier resulted in an output level of +7 dBm. This multiplier should be capable of much more. The series inductor works with the capacitance of the transistor and stray capacitance to form a " L" MATCH . (Hi – Z collector to Lo - Z BPF filter)

At the lower frequency of 324 MHz the transistor/stray capacitance is not sufficient to match the collector properly and an additional capacitor of 4.7 pF is fitted from the collector to ground. This increased the output to a level in excess of +12 dBm. Spurious rejection better than 60 dB.

Parts list (CH = CHIP COMPONENT)

C1 100 pF CH, **C2** 100nF/1uF TANT, **C3, C4, C6** 470 pF/1nF CH , **C6** 4.7 pF NPO

C7,C8,C9 2-22pF trimmers (C7 & C9 WITH 27 pF across trimmer, C8 with 22 pF across trimmer

R1 22 kΩ **R2** 2k2Ω CH **R3** 100Ω CH

R4,R6 180 Ω CH **R5** 30Ω CH (5 dB Attenuator)

L1 220 nH CH

L2 33 nH CH

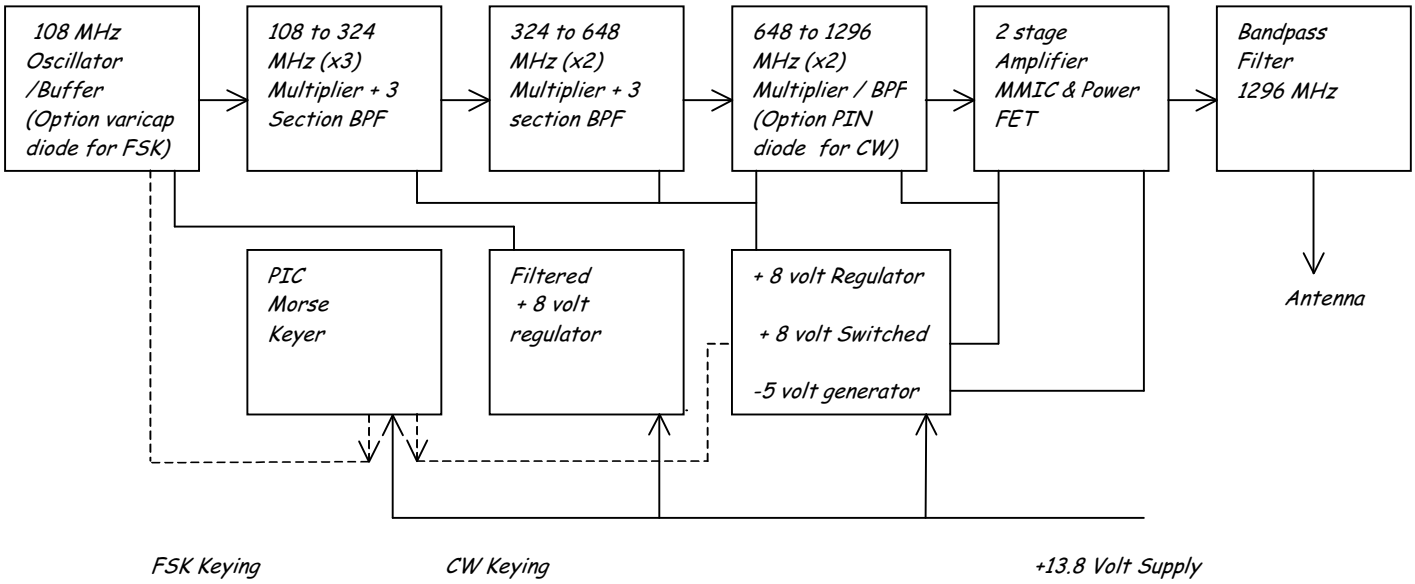
L3,L4,L5 PCB Striplines grounded at one end

Q1 2SC2367 8 GHz device. Alternatively an SMD device may also be fitted.

108 to 324 MHz Multiplier Circuit Diagram (Above)

For 324 to 648 Multiplier C5 not fitted. C7,C8, C9 are 2-10 pF trimmers only (no fixed capacitors across them) and L1 is 100 nH

Block Diagram for 1296 MHz Beacon (CW or FSK Option)



NEW ZEALAND VHF/UHF/SHF RECORDS 2002

John Wysocki ZL2TWS

Band	Frequency	Type	Stations	Date	Mode	(KMs)
6M	50MHz	O/seas	ZL3VTV/1-EH7KW	03/04/2001	SSB	19,921*
6M	50MHz	O/seas	ZL3JT-N6XQ	04/03/2001	PSK31	14,268
6M	50MHz	EME	ZL2BGJ-WA4NJP	08/09/1988	CW	13,256
2M	144MHz	Int.	ZL2ARW/p-ZL1BJB/P	03/02/1982	SSB	1,069
2M	144MHz	O/seas	ZL1HH-VK5ZEE	15/01/1986	SSB	3,467
2M	144MHz	O/seas	ZL3TY-VK2EI	14/05/2002	FSK441	2,028
2M	144MHz	EME	ZL2BGJ-G3POI	26/05/1985	CW	18,821
70cm	432MHz	Int.	ZL2ARW/p-ZL1BJB/p	03/02/1982	SSB	1,069
70cm	432MHz	O/seas	ZL2TPY-VK4ZSH/p	13/01/1988	SSB	2,402
70cm	432MHz	EME	ZL3AAD-G3SEK	12/03/1989	CW	18,970
70cm	425MHz	Int.	ZL2TWS/p-ZL2ASF/p	31/01/1982	VIDEO	373
50cm	610MHz	Int.	ZL2UGR/p-ZL2AJI/p	23/04/1988	SSB/FM	302
32cm	**925MHz**	**Int.**	**ZL2TRV/p-ZL1TBG/p**	**30/11/2002**	**NBFM**	**620**
23cm	1281MHz	Int.	ZL1TBG/p-ZL1WTT	05/07/1998	FM/ATV	76
23cm	1296MHz	Int.	ZL2ARW/p-ZL1THG/p	30/01/1982	SSB	687
23cm	1296MHz	O/seas	ZL1AVZ-VK2FZ/4	30/11/1995	SSB	2,317
23cm	1296MHz	EME	ZL3AAD-PA0SSB	13/06/1983	CW	18,657
13cm	2304MHz	Int.	ZL2ARW/p-ZL1THG/p	31/01/1982	NBFM	687
13cm	2304MHz	EME	ZL2AQE-W3IWI/8	18/10/1987	CW	13,931
9cm	3456MHz	Int.	ZL2AQE/p-ZL2ARW/p	06/03/1983	NBFM	547
5cm	5760MHz	Int.	ZL1TBG/p-ZL1TPH/p	18/03/2001	CW	317
3cm	10368MHz	Int.	ZL1THG/p-ZL2BFC/p	25/01/1981	WBFM	390
3cm	10368MHz	EME	ZL1GSG/p-DJ7FJ	12/03/1997	CW	18,340
1.2cm	24000MHz	Int.	ZL2AQE/p-ZL2AZQ/p	20/03/1988	MCW	126
2.5mm	122250MHz	Int.	ZL1TBG/p-ZL1TPH/p	25/08/2002	NBFM	0.032

Congratulations to John ZL2TRV and Ralph ZL1TBG extending the record on 925MHz by 466kms to 620kms. Congratulations also, to other recent Record Holders.

Notes:

(1) NZ 70cm band has now been reduced from 420-450MHz to 430-440MHz. The Video(TV) Record of 31/01/1982 on 425MHz stays as a 70cm Record.

(2) NZ 13cm band has now been reduced from 2300-2450MHz to 2396MHz-2450MHz. The Records of 1/01/1982 and 18/10/1987 stay as a 13cm Record. This band now known as 12cm band.

(3) NZ 50cm band has now been reduced and changed from 610-620MHz to 614-622MHz. The Record of 23/04/1988 stays as a 50cm Record.

(4) /p means portable operation. (5) /# means operating in another state or district.

(6) * 50MHz contact ZL3VTV/1-EH7KW, F2.

For a copy of the rules to follow and how to claim a record contact:
The VHF/UHF/SHF Records Co-ordinator
C/- NZART
P.O. Box 40-525
Upper Hutt.
or vhfrecords@nzart.org.nz for record updates and rules to follow when claiming a record see:
www.nzart.org.nz/nzart/vhf and http://www.nzart.org.nz/nzart/vhf/rules.html

TECH NOTES

Linear Amplifiers (see previous issue) Further to last issues discussion about stable bias systems for transistor linear amplifiers go to this site for more detail http://www.ifwtech.co.uk/g3sek/tr-bias/tr-bias1.htm

DEM transverters. There appears to be an increase in people starting to use the 1296 and 2424 MHz bands. Some years ago the DEM kits were sold locally through the Wellington VHF Group. There are some upgrades for the 2400 and 3456MHz units on the Down East Microwave site (DEM) at http://www.downeastmicrowave.com/upgrade.htm. There is also a lot of other useful information on the site http://www.downeastmicrowave.com/

Peter ZL1UKG, during construction of a 925 MHz DEM transverter, had to retune the hairpin resonators as they were considerably OFF FREQUENCY due to PCB variation.

Image rejection

Inadequate image rejection will degrade noise figure and sensitivity due to noise at the image frequency being mixed down to the IF frequency and adding to the noise presnt from the wanted frequency. If there was no image rejection then your sensitivity is degraded by 3 dB. With 10 –15 dB rejection there is a 0.4 – 0.14 dB degradation. Inadequate rejection will also make the unit more prone to out of band interference. The MMT432-144 transverter I believe suffers from this affliction from TV interference and there was a high Q filter originally available for it.

432 MHz transverters may suffer from UHF TV interference where the 2nd harmonic of the LO (808 MHz) mixes with a UHF TV channel to produce an IF product at 28 MHz. When I lived in the UK and was using a MMC432-28 Converter as part of a homebrewed transverter I heard grumblies in the transceiver which were due to this problem.

NOTE [By adjusting the frequency (changing fixed capacitor values) then the filter (Pages 1 & 2) would be useful for use in a 432 MHz transverter or receive converter as an alternative to Helical filters. Image rejection 30 dB+.

I have considered the idea of adding a third stripline to my testbed MMT432-28 transverter to significantly improve the 10-15 dB RX image rejection to 35-40 dB. (2nd RX preamp removed previously so stripline may fit there)**]** This will degrade the Noise figure slightly.

Note that with modern HF transceivers, the use of wideband preamps in the front end degrades the noise figure/ sensitivity slightly, (due to image noise generated in the preamp entering the mixer) but this is overridden by antenna noise under most conditions

Telsat Communications Ltd Garage Sale

As a result of moving locations, they have several items of Satellite TV equipment which they need to find a new home before **Feb 1st** or take to their local dump.

If you are interested please send and email to GarageSale@telsat.co.nz to receive a full list of equipment

108-324 MHz Multiplier continued

This image is of the 108-324 MHz multiplier. Note the small ceramic capacitor (4.7 pF NPO {Black Top}) in the lower left of the picture. Also a 5 dB attenuator (right) is fitted to reduce the +12 dBm to ~ +7 dBm. The attenuator also provides a wideband match to the following multiplier. Remember the VSWR (or Return loss) of the filter is only good over a small range of frequencies. Connecting this directly into a following multiplier stage (which is biased into the non linear region) may result in instability.

The current is ~ 25 mA (5.5 V DC from top of 22k to Ground)
The other multipliers already built for this project will be looked at further, to see if the collector match can be improved with the addition of a small capacitor (L Match). A 2SC2367 used in a 1212-2424 MHz multiplier achieved +14 dBm, so some improvement is looked for in the 648 to 1296 MHz multiplier which currently has ~ +8 dBm.

Await next issue for developments

Kevin
ZL1UJG